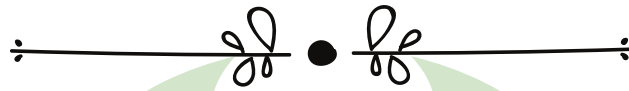


BIOHACK NOTES



PRINCIPLES OF INHERITANCE AND VARIATION

- BASED ON ACTIVE RECALL AND SPACED REPETITION
- TARGET 360/360 IN NEET BIOLOGY & 100/100 IN BOARDS!



PARTH GOYAL





• MENDEL'S LAWS OF INHERITANCE

1. Heredity is the basis of inheritance. T/F
2. Sahiwal cows are of _____ state, and are selected through _____
3. Gregor Mendel experimented on _____ for ____ no. of years from year _____-_____ (NEET)
4. Mendel selected _____ no. of true breeding pea plant varieties. (NEET)
5. Pod shape contrasting traits were -
6. Dominant pod colour is yellow/green.
7. Name all the 7 characters taken by Mendel and their contrasting characters - (More than 5 times in NEET)
8. _____ are the unit of inheritance.
9. Punnett square was developed by German/British geneticist name _____ (NEET)
10. What is test cross?
11. Mendel called genes as -
12. Phenotypic ratio of dihybrid cross -
13. No. of genotypes produced in dihybrid cross -
14. Genotypic ratio in dihybrid cross -
15. How many types of genotypes are produced when a plant with genotype AABbccDd is self-pollinated?
16. How many types of phenotypes are produced when AABbccDd is self-pollinated?
17. How many types of gametes are produced in plant with genotype AABbccDdEe?
18. How many types of phenotypes when AaBb x aaBb?
19. Alternative form of genes are called _____ (NEET)
20. Name the 3 laws given by Mendel.
21. "Factors occur in pairs", is a statement of Mendel's 2nd law. T/F
22. "Alleles do not show any blending" is a statement of -
23. Incomplete dominance is seen in - (I) (NEET)
24. Dog flower other 2 names are -
25. In a diploid organism, a pair of alleles are present. T/F
26. The modified allele is generally the recessive allele. T/F
27. In case of _____, F₁ generation resembles both the parents.
28. Ex. of codominance is -
29. Dominance is an autonomous feature of a gene. T/F
30. Starch grain when compared w.r.t to shape shows complete/incomplete dominance but when compared w.r.t size shows complete/incomplete dominance.
31. Define law of independent assortment -

DigaQ. I

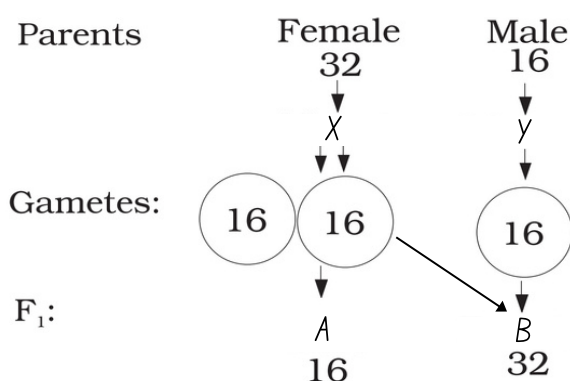




• CHROMOSOMAL THEORY OF INHERITANCE

32. Mendel published his work on inheritance in year _____.
33. In _____ year, name the 3 scientists who rediscovered Mendel theory.
34. In _____ year, _____ and _____ gave experimental verification of chromosomal theory of inheritance. (NEET)
35. "Independent pair segregate independently of each other". This statement cannot be used for chromosome/gene.
36. Morgan worked on _____
37. Why did morgan chose fruitfly over others. Give reasons (5)
38. Morgan hybridised yellow-bodied females with brown bodied males. T/F
39. Morgan hybridised red-eyes females with white-eyes males. T/F
40. Why morgan chose X-linked traits ?
41. _____ and _____ were very tightly linked and showed only 1.3 per cent recombination.
42. _____ and _____ wing showed 37.2 per cent recombination.
43. Morgan student name _____ discovered _____ (NEET)
44. _____ coined the term linkage. (NEET)
45. One character can be controlled by many genes. T/F
46. Such phenomenon is called _____
47. Polygenic inheritance is not influenced by environment. T/F
48. Ex. of polygenic inheritance are - (2) (NEET)
49. When a single gene control many characters, phenomenon is called _____ (NEET)
50. Such genes are called _____ gene.
51. Ex. of pleiotropy is - (1)
52. Phenylketonuria is caused by mutation in the gene that codes for enzyme _____
53. This cause multiple phenotypic expressions. Name them - (3)

DigaQ. 2



PARTH GOYAL



• SEX DETERMINATION & MUTATION

54. _____ discovered X chromosome in year _____
55. *Drosophila* sex determination is similar to _____ (NEET)
56. XO type sex determination ex - (I) (NEET)
57. ZW type is present in - (I)
58. ZO type is present in - (I)
59. Female honey bees have _____ no. of chromosomes.
60. Honey bees don't have father and son. T/F
61. _____ sex determination system operate in honeybees.
62. Males in honey bees are formed by the means of _____
63. _____ and _____ live as diploid in honey bees.
64. Chromosomal aberrations are commonly observed in _____ cells.
65. *Ex. of a disease caused by point mutation - (NEET)*
66. UV radiations cause mutation. T/F



• GENETIC DISORDERS

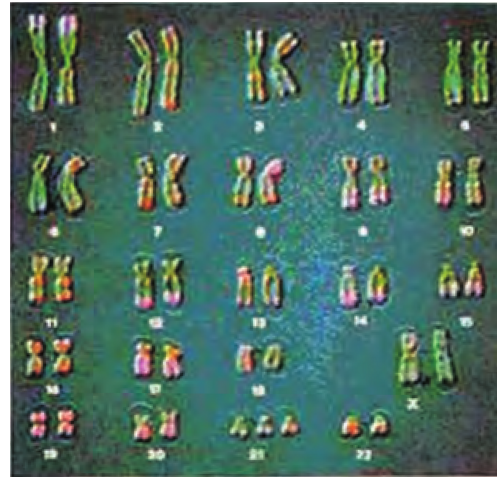
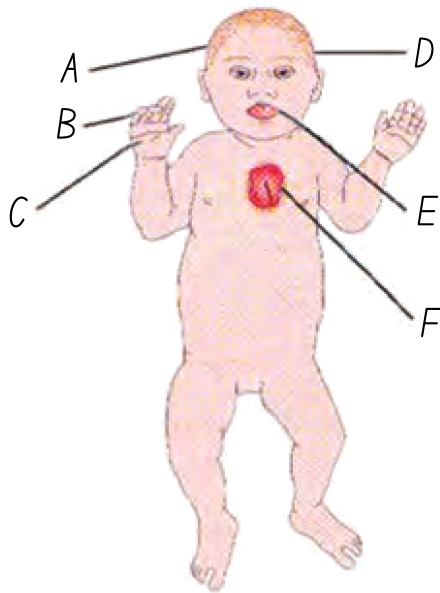
67. Name the 2 categories of genetic disorders -

• MENDELIAN DISORDERS

68. Name the mendelian disorders given in NCERT (6) -
69. *Ex. of 2 sex linked recessive disorders - (NEET)*
70. Ex. of 3 autosomal linked recessive disorders -
71. What is affected in haemophilia ?
72. The family pedigree of _____ shows a number of haemophilic descendents.
73. Queen Victoria was not the carrier of haemophilia. T/F
74. Sickle cell trait has persisted in africa because of giving survival advantage against the disease -
75. Substitution of _____ by _____ at ____th position of the alpha/beta position of haemoglobin occurs in sickle cell anaemia.
76. The 6th codon i.e. GAG is converted to _____ which cause sickle cell anaemia.
77. Under high/low oxygen tension, the mutant haemoglobin molecule polymerises.
78. _____ is not converted to _____ in phenylketonuria.
79. As a result, phenylalanine is then converted into _____
80. What does "Phenylketonuria" means ?



DigaQ. 3



G

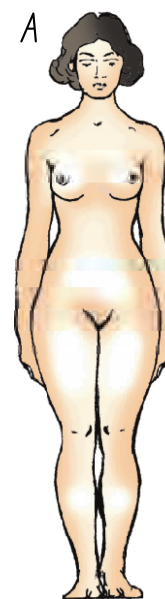
81. Tell a symptom of phenylketonuria -
82. People suffering from colour blindness are not able to differentiate between ____ and ____ colour.
83. Color blindness occurs in ____% of males and ____% of females.
84. Abnormal haemoglobin molecules are formed in thalassemia. T/F
85. What is the characteristic/symptom of thalassemia ?
86. Main reason which actually cause thalassemia is -
87. α -thalassemia is controlled by gene _____ and _____ on chromosome _____
88. β -thalassemia is controlled by gene _____ at chromosome ____
89. What is the difference between thalassemia and sickle cell anaemia ? (NEET)

• CHROMOSOMAL DISORDERS

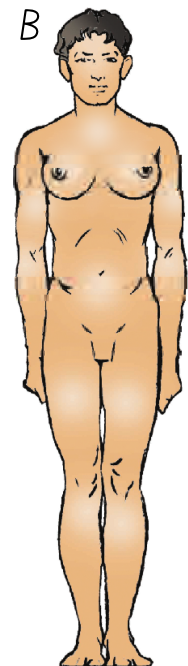
90. What is aneuploidy?
91. Polyploidy condition is often seen in plants/animals.
92. What happens in Down's syndrome? (NEET)
93. This disorder was describe by _____ in year _____
94. Features of Down's syndrome - (12)
95. Klinefelter's syndrome features - (3) (NEET)
96. Turner syndrome features - (5) (NEET)

DigaQ. 4

A



B



PARTH GOYAL

PRINCIPLES OF INHERITANCE AND VARIATION



PARTH GOYAL



ANSWERS

• MENDAL'S LAWS

1. F, inheritance is the basis of heredity

2. Punjab, artificial selection

3. Garden pea, 7, 1856-1863

4. 14

5. Inflated/constricted

6. Green

7.

S.No.	Characters	Contrasting Traits
1.	Stem height	Tall/dwarf
2.	Flower colour	Violet/white
3.	Flower position	Axial/terminal
4.	Pod shape	Inflated/constricted
5.	Pod colour	Green/yellow
6.	Seed shape	Round/wrinkled
7.	Seed colour	Yellow/green

8. Genes

9. British, Reginald C. Punnett

10. Test cross is used to determine the genotype of an organism showing dominant phenotype

11. Factors

12. 9:3:3:1

13. 9

14. $RRYY \text{ I: } RRYy \text{ 2: } RRyy \text{ I: } RrYY \text{ 2: } RrYy \text{ 4: } Rryy \text{ 2: } rrYY \text{ I: } rrYy \text{ 2: } rryy \text{ I}$

15. Types of genotypes = $3^{\text{No. Of heterozygous pairs}} \times 2^{\text{No. Of homo-hetero pairs}}$, so here, Bb and Dd will form two different heterozygous pairs, and no. of homo-hetero pairs are absent (as this is self-cross), hence ans = $32 = 9$

16. Types of phenotypes = $2^{\text{No. Of heterozygous pairs}} \times 2^{\text{No. Of hetero-recessive homo pairs}}$, so here, Bb and Dd will form two different heterozygous pairs, and no. of homo-hetero pairs are absent (as this is self-cross), hence ans = $22 = 4$

17. Types of gamete = $2^{\text{No. Of heterozygous pairs}}$, so here, Bb, Dd and Ee will form 3 different heterozygous pairs hence ans = $23 = 8$

18. Using formula, Types of phenotypes = $2^{\text{No. Of heterozygous pairs}} \times 2^{\text{No. Of hetero-recessive homo pairs}}$, ans = $2 \times 2 = 4$

19. Alleles

20. Law of Dominance, Segregation and Independent assortment

21. F

22. 2nd law

23. Dog flower

24. Snapdragon or *Antirrhinum* sp.

25. T

26. T

27. Codominance

28. Human blood group

29. F

30. Complete, incomplete

31. when two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters

• CHROMOSOMAL THEORY OF INHERITANCE

32. 1865

33. 1900, de Vries, Correns and von Tschermak

34. 1902, Walter Sutton and Theodore Boveri

35. Gene

36. *Drosophila melanogaster*

37. Morgan chose fruitfly because

- I. Could be grown on simple synthetic medium
- II. complete their life cycle in about two weeks
- III. Single mating could produce a large number of progeny
- IV. clear differentiation of the sexes
- V. many types of hereditary variations that can be seen with low power microscopes



PARTH GOYAL

38. T
39. F
40. By selecting x-linked traits, we reducing the complexity of the process as we are only witnessing recombination between the 2 X chromosomes of females as male have XY and no recombination occur between them.
41. White and yellow
42. White and miniature
43. Alfred Sturtevant, chromosome mapping
44. Morgan
45. T
46. Polygenic inheritance
47. F
48. Human height and skin colour
49. Pleiotropy
50. Pleiotropic gene
51. Phenylketonuria
52. Phenylalanine hydroxylase
53. Mental retardation, reduction in hair and skin pigmentation

• SEX DETERMINATION & MUTATION

54. Henking(1891)
55. Humans
56. Grasshopper
57. Birds
58. Butterflies
59. 32
60. False, onl males don't have father or sons
61. Haploiddiploid sex determination
62. Parthenogenesis
63. Queen and workers
64. Cancer
65. Sickle-cell anaemia
66. T

• GENETIC DISORDERS

67. Mendelian and chromosomal
68. Haemophilia, Cystic fibrosis, Sickle-cell anaemia, Colour blindness, Phenylketonuria, Thalassemia
69. Haemophilia & color blindness
70. Sickle cell anaemia, phenylketonuria and thalassemia
71. a single protein that is a part of the cascade of proteins involved in the clotting of blood
72. Queen victoria
73. F
74. Malaria
75. Glutamic acid by valine at 6th, beta
76. GUG
77. Low
78. Phenylalanine to tyrosine
79. Phenylpyruvate
80. "Phenyl" refers to phenylalanine, "keto" refers to keto versions of phenylalanine like phenylpyruvate (which are formed as a result of absence of phenylalanine hydroxylase), "nuria" refers to their excretion in urine. Hence phenylalanine keto form are excreted in urine in this disease.
81. Mental retardation
82. Green and red
83. 8, 0.4
84. T
85. Anaemia
86. Reduced rate of synthesis of globin chains
87. HBA1 and HBA2, 16
88. HBB, 11
89. Thalassemia is a quantitative problem which sickle cell anaemia is a qualitative problem



PARTH GOYAL

90. Failure of segregation of chromatids during cell division cycle results in the gain or loss of a chromosome(s), called aneuploidy

91. Plants

92. Trisomy at chromosome 21

93. Langdon Down (1866)

94. Features of Down's syndrome

- I. short statured
2. small round head
3. furrowed tongue
4. partially open mouth
5. Palm is broad
6. characteristic palm crease
7. Retarded physical, psychomotor and mental development
8. Broad flat face
9. Big and wrinkled tongue
10. Congenital heart disease
11. Flat back of head
12. Many "loops" on finger tips

95. Klinefelter's syndrome features

- I. Overall masculine development
- II. Gynecomastia
- III. Sterile
- IV. Tall stature

96. Turner syndrome features

- I. Rudimentary ovaries
- II. Lack secondary sexual characters
- III. Sterile
- IV. Short stature

• DigaQs

DigaQ. 1 – Incomplete dominance in Snapdragon plant

DigaQ. 2 – Sex determination in honeybee

X – Meiosis

A – Male

Y – Mitosis

B – Female

DigaQ. 3 – Down's syndrome

A – Flat back of head

B – Many loops on finger tips

C – Palm crease

D – Broad flat face

E – Big and wrinkled tongue

F – Congenital heart disease

G – Chromosomes in a person suffering Down's syndrome

DigaQ. 4 – Chromosomal disorders

A – Turner's syndrome

B – Klinefelter syndrome



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